

**Analysis of Total Suspended Particles (TSP)
and Total Organic Carbon (TOC)
in Air Samples**

Integrated Atmospheric Deposition Network (IADN)

TSP/TOC Procedure

Prepared By

Michael Wassouf and Ilora Basu

School of Public and Environmental Affairs
Indiana University
Bloomington, Indiana 47405

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Introduction

Air particulates are collected from three sites: Eagle Harbor, 100 meters from Lake Superior, Michigan on the Keweenaw Peninsula; Sleeping Bear Dunes, on Lake Michigan 5 km south of Empire, Michigan; and Sturgeon Point, 25 km southwest of Buffalo, New York and 100 meters from Lake Erie. Air is drawn through the Whatman quartz microfibre filter, 20.3 x 25.4 cm at a flow rate of 68m³/hr for 24 hours using an Anderson Hi-Vol air sampler. All particles greater than two microns are retained by the filter. The filters are then transported to Indiana University where they are analyzed for the total suspended particle and total organic carbon.

Supplies

1. Quartz Microfibre Filters (Whatman 20.3 x 25.4 cm)
2. LiNO₃
3. Aluminum foil
4. Tweezers
5. Hexane (EM Science, Omnisolv)
6. Plastic Zip-Lock bags

Equipment

1. Balance (Mettler AE 50)
2. Mettler Balance GD Hanger
3. Humidity Chamber (Lab-Line Desicab No. 1477) with wet LiNO₃ in a tray.
4. Leco Total Carbon Analyzer
5. Muffle Furnace (Thermolyne Type 30400)

Balance Calibration

1. The balance must be connected to the power supply for at least 60 minutes before calibrating.
2. Press and hold the single control bar until -CAL- appears in the display, then release the control bar. The display changes to CAL----, followed by CAL 50 (blinks).
3. Move calibration lever all the way to the rear; the display changes to CAL----, followed by 50.0000, then to CAL 0 (blinks).
4. Move calibration lever all the way back to the front of the balance; the display changes to ----, followed by 0.0000.

Filter Preparation Before Sampling

1. Wrap filters in aluminum foil (shiny side out).
2. Muffle filters for 4-6 hrs. @ 450°C, store in freezer until use.
3. Open foil slightly and place filters in desiccator (50% humidity via LiNO₃) for 24 hrs.
4. Re-zero balance.
5. Write **Filter ID#** in top right corner of filter with pencil.
6. Open balance hanger and insert filter (unwrapped) using tweezers rinsed in hexane; close door.
7. Wait until balance equilibrates and record mass in **Filter Log Book** as **Initial Weight**.
8. Remove filter from balance and re-zero.
9. Weigh filter again; if mass is within 0.1 mg of first mass go on, if not repeat weighing until 2 measurements within 0.1mg are taken and record the average as **Initial Weight**.
10. Re-wrap filter in original piece of aluminum foil .
11. Write **Filter ID#** on foil with magic marker.
12. Place in plastic zip-lock bag.
13. Repeat 1-12 for each filter.

TSP Measurement on Filter

1. Remove filter from plastic bag; open foil slightly and place in desicator for 24 hrs.
2. Record **Sample ID Code** with corresponding **Filter ID#** in **Filter Log Book** and on plastic bag.
3. Weight filter as above.
4. Record mass as **Final Weight**.
5. Calculate and record **TSP (Final Weight - Initial Weight)**.
6. Re-wrap filter in original foil and plastic bag.
7. Place in cold room or freezer until TOC analysis.

Preparing Filters for TOC Analysis

1. Remove filter from bag and foil.
2. Cut six discs, 1.9 cm diameter, from filter with cork borer and place discs in a plastic petri dish.
3. Record **Sample ID Code** on petri dish.
4. Record **TSP** from **Filter Log Book** in **TSP/TOC Log** as **TSP on Filter**.
5. Calculate and record **TSP on Circle** (**TSP on Filter** x 2.84/404). The area of the whole filter is 404 sq. cm. The area of the circle is 2.84 sq. cm.
6. Multiply **TOC** by six, this is the number you will enter into the Leco Carbon Analyzer.

TOC Analysis: Using LEKO Total Carbon Analyzer

See following pages (from Leco operator's manual)